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Santa Barbara
Remote Sensing

MODIS Science Team Meeting
PFM/FM1 Status

NASA GSFC
Contract No. NAS 5-30800

5 May 1999

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Agenda

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- PFM status/issues
- FM1 general status
- FM1 emissive band accuracy results
- Summary/Issues
- Appendix - Out-of-Band spectral data

PFM Status/Issues

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- **S/C at Vandenberg**
- **MODIS IGSE up and running**
- **Preparations underway for CPT and final tests**
- **S/C level science checks for MODIS have completed**
- **S/C->TDRSS->EDOS->DAAC level science checks not completed for MODIS by Raytheon/SBRS**
  - Inability to access DAAC level science data prior to launch is a concern
  - Meeting scheduled this week with MCST

FM1 Instrument Diagnostics/ Re-Work Completed

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- **November TV test uncovered anomalies**
  - Low-current power supply shutdown
  - Noise on the redundant side
- **Significant diagnostics have identified/solved these problems**
- **TV re-test is scheduled for mid-May**
  - TV test emphasis is on verifying fixes
  - TV timeline is in the review cycle
- **Instrument completion scheduled for mid-summer '99**

FM1 Power Supply Diagnostics/Rework Completed

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- **Power supply shut down under certain minimal load conditions during TV test**
  - All shutdowns related to instrument timing re-synchronization
- **Three attempts at corrective action made within the supply**
  - Noise filtering
  - Pulse edge suppression during re-synchronization
  - Shield configuration changes
- **Shutdown traced to oscillating circuit (within the supply)**
  - Shield capacitance path caused the noise/oscillation
  - Bench test of re-worked supply demonstrated 50% margin to peak load, 90% margin to average science load
  - Instrument level test passed highest expected load (~10% margin to peak, ~40% margin to average)

FM1 Rdt Diagnostics/Rework Completed

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- **High noise was observed during redundant mode testing**
  - Noise appeared on both CFPA temperature telemetry and on the CFPA bands 5,6,7, and 20 thru 36
- **Systematic disassembly/diagnostics isolated the primary cause to a wiring error**
  - Main Electronics Module removed from instrument mainframe
  - Capacitor filtering/wire re-routing proved ineffective
  - Spectrum analyzer loop test performed on backplane in vicinity of problem
  - Two single-ended shields were found tied to clock lines instead of ground;high speed clocks were driving the shields
  - Shield drain wires were correctly terminated to ground
- **Telemetry and CFPA noise are significantly reduced after repair; TV test will produce final noise results**

SDSM Sun Screen Diagnostics/Rework Completed

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- **Review of Solar Diffuser Stability Monitor (SDSM) gains indicated inadequate margin to saturation**
  - Sun view observations through 2% screen showed potential saturation in worst case scenario
  - Instrument test successfully confirmed SDSM radiometric gains
- **Sun view screen removed and replaced with lower transmitting screen**
  - Provided 15% to 20% margin against saturating the sun view
  - Fix has been implemented on FM1 and PFM

MODIS FM1 MW/LWIR Meets Radiometric Calibration Spec

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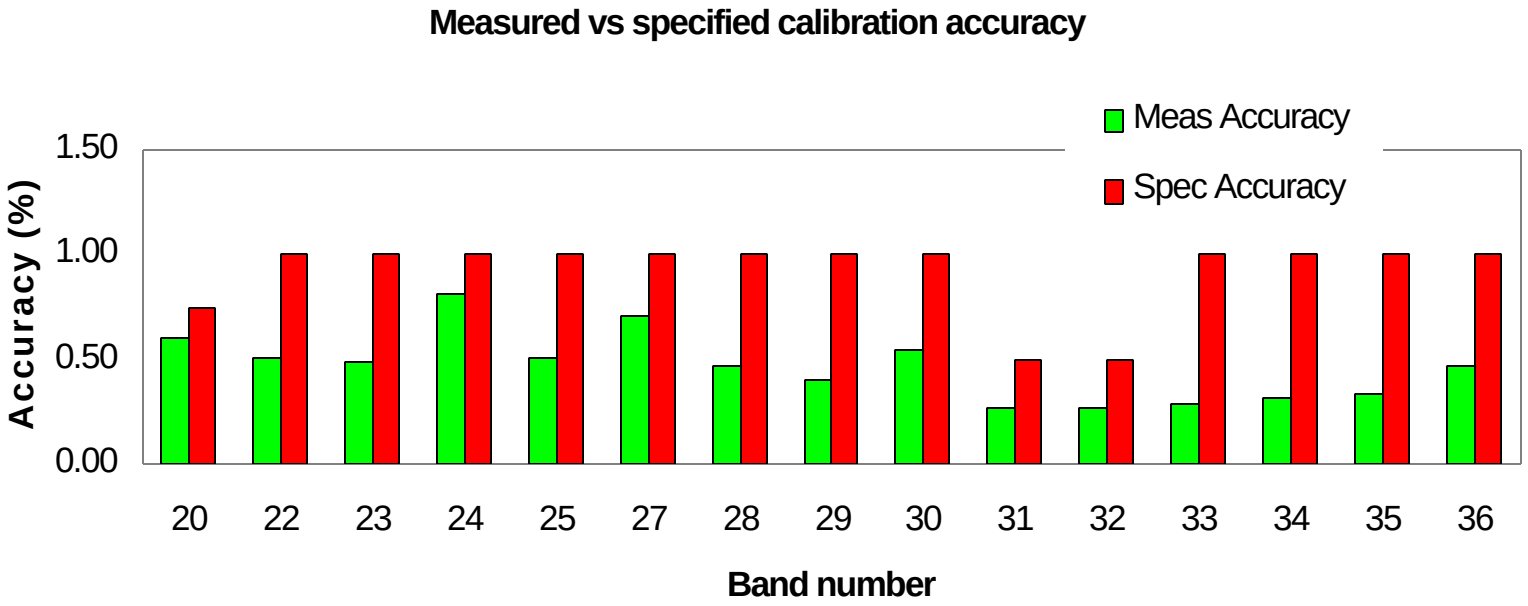
- **Accuracy calculated from uncertainties in:**
  - Center wavelength, BCS temperature, RVS, polynomial fit residuals
- **May require RVS re-verification of Bands 29 and 30**
  - On-going dialogue with GSFC/MCST



MODIS FM1 RVS Is Not The Dominant Contributor

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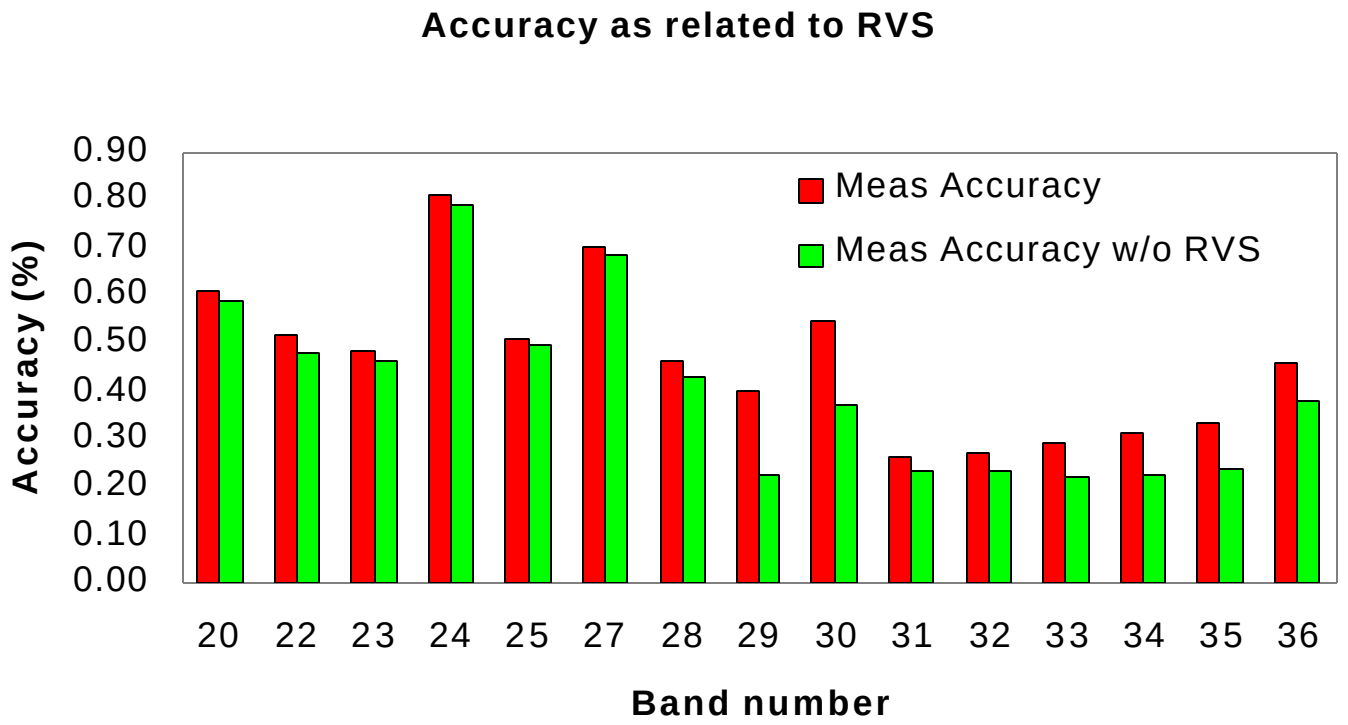
- Contributors are assumed independent and RSS'd.
- Assumes On-Orbit Maneuver Quantifies Scan Mirror Emission.



On-Orbit Usage Requires Combining Calibration Accuracy With Noise

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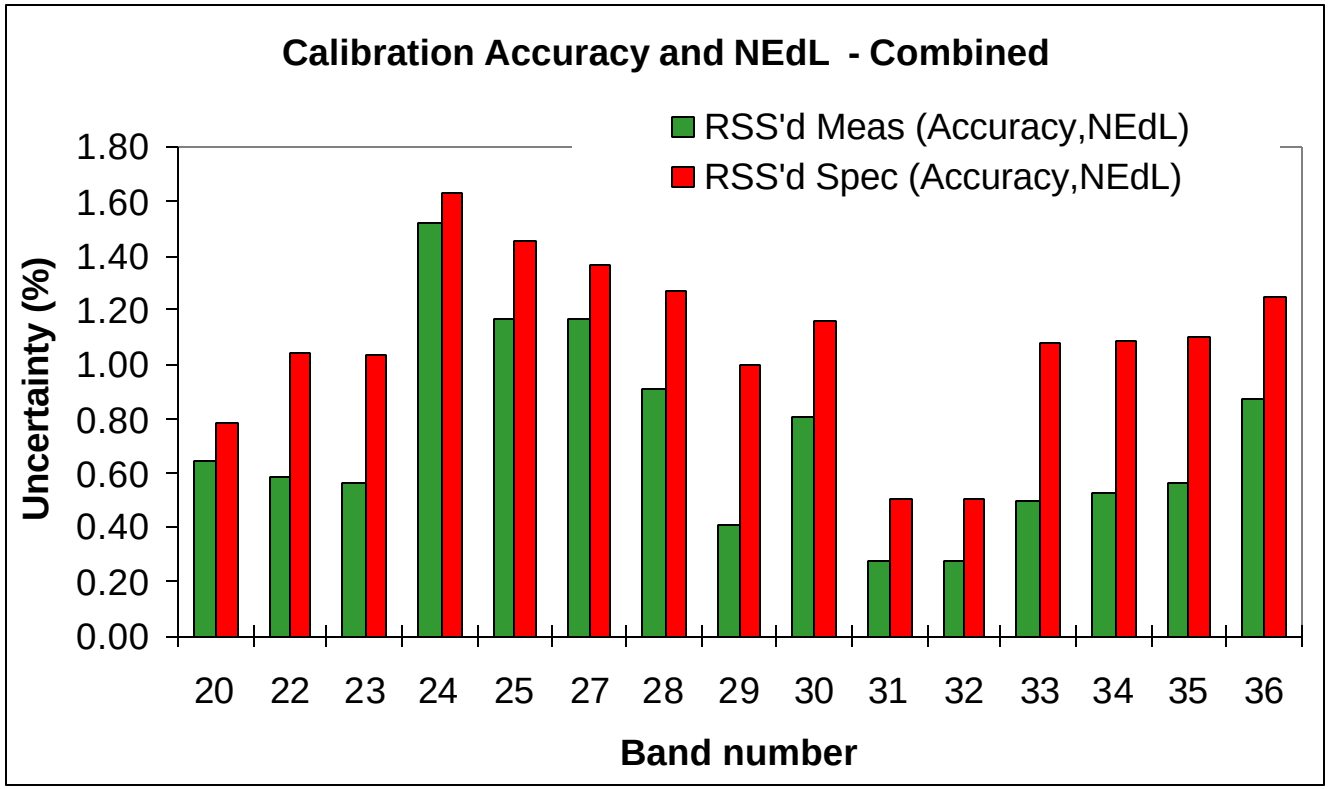
- Calibration accuracy spec written in terms of multiple samples
- Single sample accuracy must combine calibration accuracy (bias) and random noise (NEdL)



MODIS FM1 Calibration Accuracy Converted to Temperature Domain

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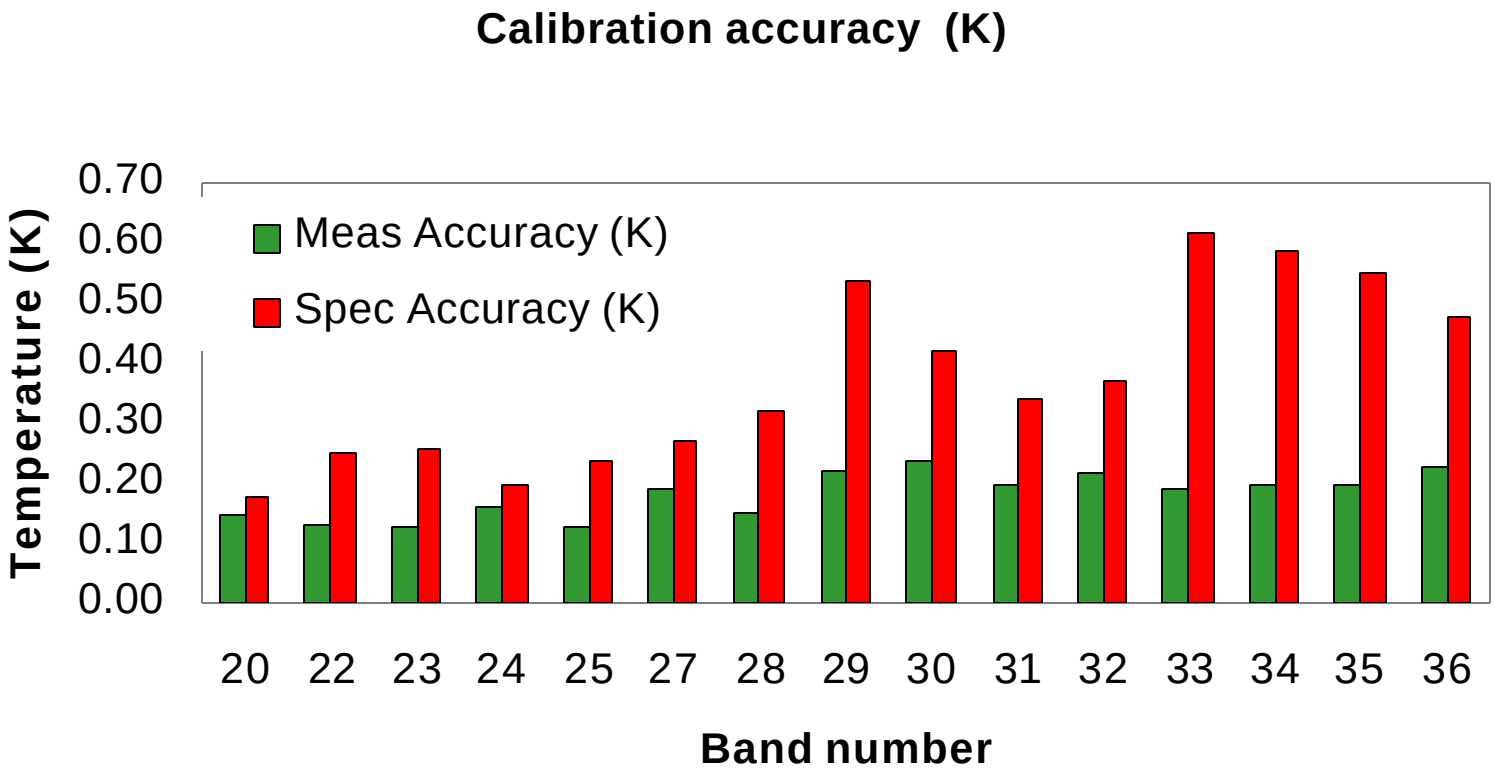

MODIS FM1 Calibration Accuracy Combined With NEdT

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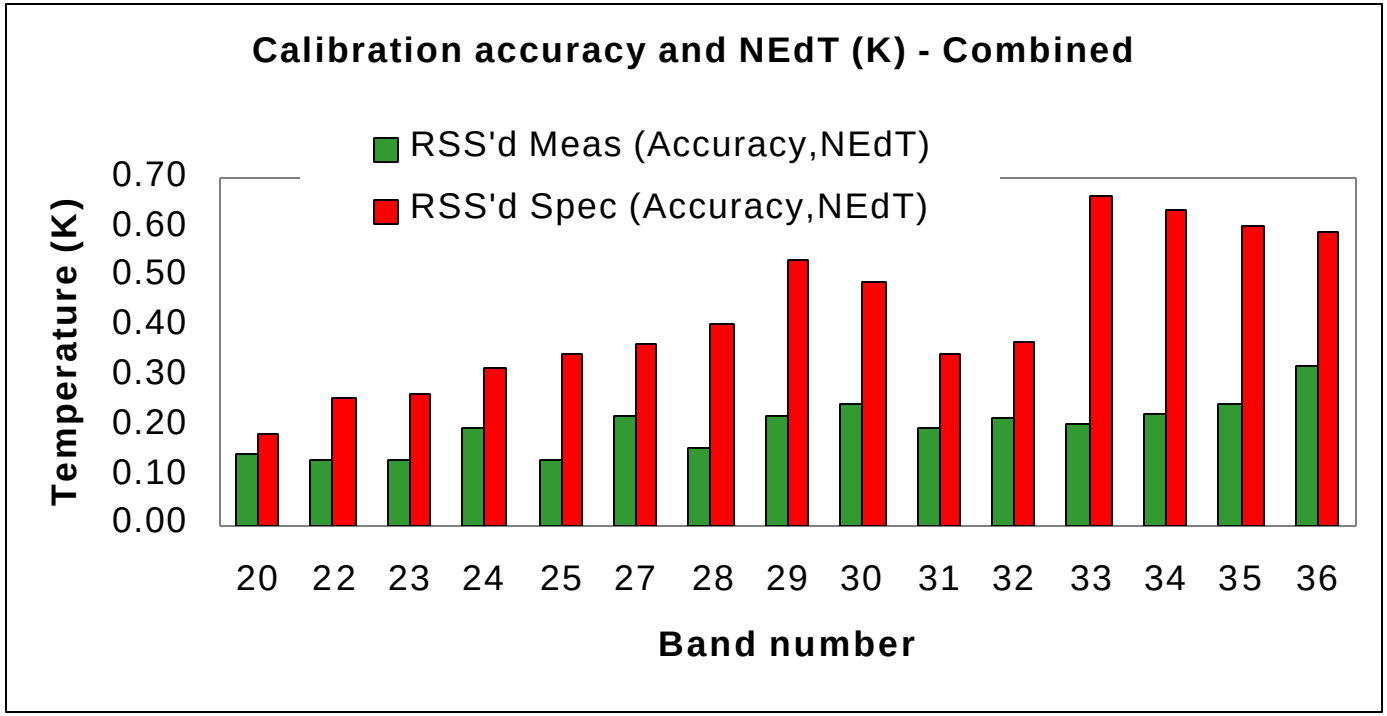

MODIS FM1 Reflectance Bands Radiance Accuracy

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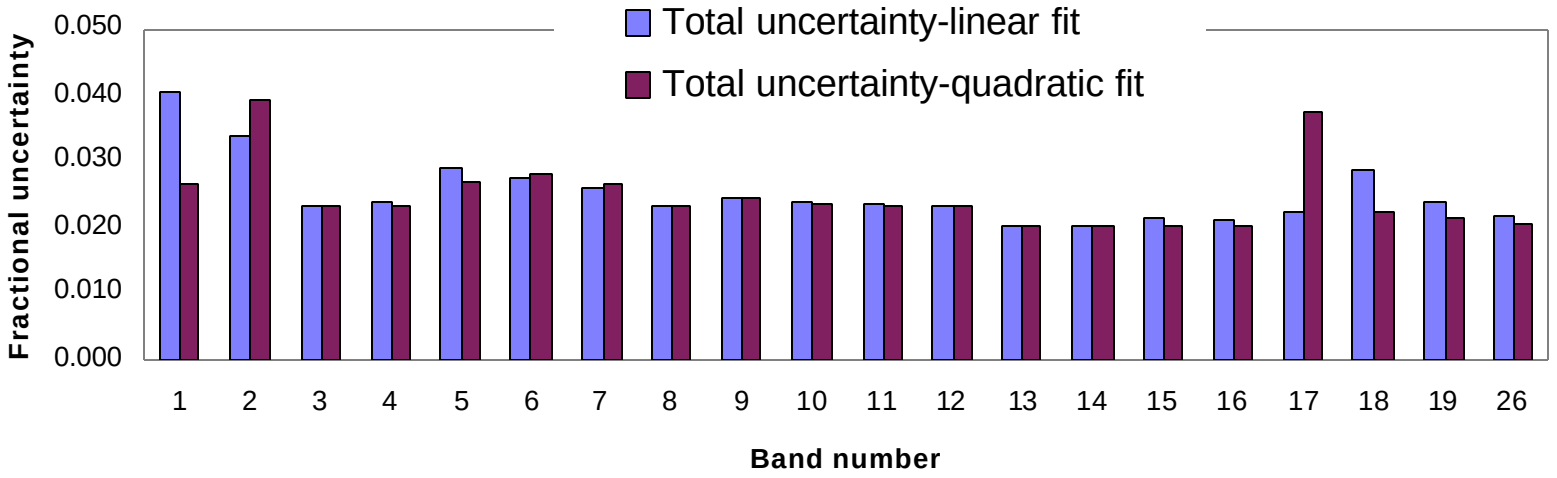
- **Specification spectral radiance accuracy - 0.05**
- **Uncertainty includes: linear or quadratic fit residuals, SIS(100) radiance uncertainty; RVS @ 0.002 for VIS / NIR and 0.005 for SWIR**
- **Note that linear and quadratic fit residuals are very similar except for bands 1, 2, 17, & 18. Residuals are suggestive of SIS(100) linearity problems.**

Reflectance region - Radiance uncertainty



MODIS FM1 Reflectance Bands Reflectance Accuracy

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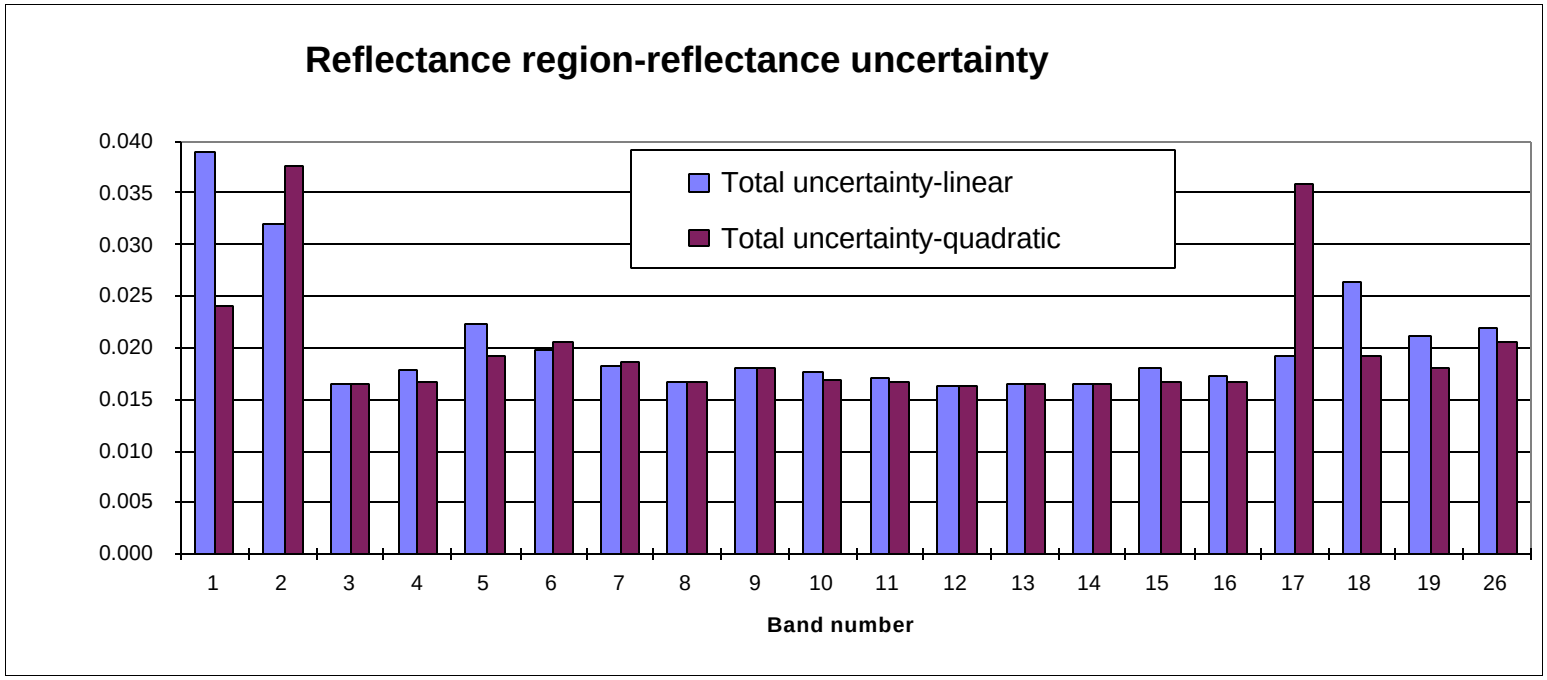
- Specification reflectance accuracy - 0.02
- Uncertainty includes: linear or quadratic fit residuals, solar diffuser BRDF @ 0.016; RVS @ 0.002 for VIS / NIR and 0.005 for SWIR
- Note that linear and quadratic fit residuals are very similar except for bands 1, 2, 17, & 18. Residuals are suggestive of SIS(100) linearity problems.



Summary/Issues

- **FM1 demonstrates compliance to majority of calibration specifications**
  - Minor non-compliances flagged to GSFC
- **Post TV FM1 ambient diagnostics completed**
- **FM1 ready for TV penalty test**
- **No changes expected in radiometric performance parameters**
  - Both primary and redundant analog signal chains characterized with “A” processor; quiet configuration
- **TV will verify fixes over environments**
  - Power supply shutdown
  - Rdt noise anomaly

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Out-of-Band Spectral Data

Appendix